

CLAIMS:

1. A coated article including a coating supported by a glass substrate, the coating comprising:

first and second infrared (IR) reflecting layers comprising silver (Ag);

a first dielectric layer comprising titanium oxide provided between the first IR reflecting layer and the glass substrate;

a second dielectric layer having an index of refraction $1.8 \leq n \leq 2.2$ provided between the first and second IR reflecting layers, wherein the second dielectric layer has an index of refraction n less than the index of refraction n of the first dielectric layer;

a third dielectric layer comprising titanium oxide provided over the first and second IR reflecting layers;

a fourth dielectric layer comprising silicon oxide provided over the third dielectric layer comprising titanium oxide; and

wherein the coated article has a visible transmission of at least 70%.

2. The coated article of claim 1, wherein the second dielectric layer comprises tin oxide.

3. The coated article of claim 1, further comprising another dielectric layer comprising titanium oxide located between the first and second IR reflecting layers.

4. The coated article of claim 3, wherein the another dielectric layer comprising titanium oxide is located under the second dielectric layer.

5. The coated article of claim 3, further comprising another dielectric layer comprising tin oxide located between the third dielectric layer comprising titanium oxide and the fourth dielectric layer comprising silicon oxide.

6. The coated article of claim 1, wherein each of the first and second IR reflecting layers comprising Ag is sandwiched between and contacts a pair of contact layers, and wherein at least one of the contact layers adjacent each IR reflecting layer comprises at least one of NiCr, NiCrO_x, and NiCrN_x.

7. The coated article of claim 3, further comprising another dielectric layer comprising silicon nitride located between the first dielectric layer comprising titanium oxide and the first IR reflecting layer comprising Ag.

8. The coated article of claim 1, wherein the first dielectric layer comprising titanium oxide includes TiO₂, and wherein the silicon oxide comprises SiO₂.

9. The coated article of claim 3, wherein the coated article is characterized by a visible transmission of at least 75%, a sheet resistance (R_s) of no greater than 10 ohms/square, and a glass side visible reflectance $\leq 9\%$.

10. The coated article of claim 3, wherein the coated article has a visible transmission of at least 76.5%.

11. An IG window unit comprising the coated article of claim 1.

12. A coated article including a coating supported by a glass substrate, the coating comprising:

first and second infrared (IR) reflecting layers each comprising at least one of silver (Ag) and gold (Au);

a first dielectric layer comprising titanium oxide provided between the first IR reflecting layer and the glass substrate;

a second dielectric layer comprising titanium oxide provided between the first and second IR reflecting layers;

a third dielectric layer having an index of refraction $1.8 \leq n \leq 2.2$ provided between the first and second IR reflecting layers, wherein the third dielectric layer has an index of refraction n less than the index of refraction n of at least one of the first and second dielectric layers;

a fourth dielectric layer comprising silicon oxide provided over the first and second IR reflecting layers; and

wherein the coated article has a visible transmission of at least 70%.

13. The coated article of claim 12, wherein the third dielectric layer comprises tin oxide.

14. The coated article of claim 12, further comprising another dielectric layer comprising silicon nitride provided between the second IR reflecting layer and the fourth dielectric layer comprising silicon oxide.

15. The coated article of claim 12, further comprising another dielectric layer comprising titanium oxide provided between the second IR reflecting layer and the fourth dielectric layer comprising silicon oxide.

16. The coated article of claim 12, further comprising another dielectric layer comprising tin oxide provided between the second IR reflecting layer and the fourth dielectric layer comprising silicon oxide.

17. The coated article of claim 12, further comprising another dielectric layer comprising silicon nitride located between the first dielectric layer comprising titanium oxide and the first IR reflecting layer.

18. The coated article of claim 12, wherein each of the first and second IR reflecting layers comprises Ag and is sandwiched between and contacts a pair of contact layers, and wherein at least one of the contact layers adjacent each IR reflecting layer comprises at least one of NiCr, NiCrO_x, and NiCrN_x.

19. The coated article of claim 12, wherein the first and second dielectric layers comprising titanium oxide each include TiO₂.

20. The coated article of claim 12, wherein the coated article is further characterized by a visible transmission of at least 75%, a sheet resistance (R_s) of no greater than 10 ohms/square, and a glass side visible reflectance $\leq 9\%$.

21. The coated article of claim 20, wherein the coated article has a visible transmission of at least 76.5%.

22. A window comprising the coated article of claim 12.

23. A coated article including a coating supported by a glass substrate, the coating comprising:

first and second infrared (IR) reflecting layers each comprising at least one of silver (Ag) and gold (Au);

a first dielectric layer comprising titanium oxide provided between the first IR reflecting layer and the glass substrate;

a second dielectric layer comprising titanium oxide provided between the first and second IR reflecting layers;

a third dielectric layer having an index of refraction $1.8 \leq n \leq 2.2$ provided between the first and second IR reflecting layers, wherein the third dielectric layer has an index of refraction n less than the index of refraction n of at least one of the first and second dielectric layers;

a fourth dielectric layer comprising at least one of silicon nitride and silicon oxynitride provided over the first and second IR reflecting layers; and

wherein the coated article has a visible transmission of at least 70%.

24. The coated article of claim 23, wherein the fourth dielectric layer comprises silicon oxynitride.

25. The coated article of claim 24, wherein the fourth dielectric layer comprising silicon oxynitride is at least one of oxidation graded and nitrogen graded, so that an index of refraction n of the fourth dielectric layer comprising silicon oxynitride changes from a first value in a first portion of the fourth dielectric layer to a smaller second value in a second portion of the fourth dielectric layer, wherein the second portion of the fourth dielectric layer comprising silicon oxynitride with the smaller index of refraction n is further from the IR reflecting layers than is the first portion of the fourth dielectric layer.

26. A coated article including a coating supported by a glass substrate, the coating comprising, from the glass substrate outwardly:

- a first dielectric layer comprising silicon zirconium nitride;
- a first contact layer comprising at least one of NiCr, NiCrO_x and NiCrN_x;
- a first IR reflecting layer comprising Ag;
- a second contact layer comprising at least one of NiCr, NiCrO_x and NiCrN_x;
- a second dielectric layer comprising silicon zirconium nitride;

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a third dielectric layer having an index of refraction n less than an index of refraction n of at least one of the first and second dielectric layers;
a third contact layer comprising at least one of NiCr, NiCrO_x and NiCrN_x;
a second IR reflecting layer comprising Ag;
a fourth contact layer comprising at least one of NiCr, NiCrO_x and NiCrN_x;
a fourth dielectric layer comprising silicon oxide; and
wherein the coated article has a visible transmission of at least 70% and a sheet resistance (R_s) of no greater than 10 ohms/square.

27. The coated article of claim 26, wherein the coated article has a visible transmission of at least 75%.

28. The coated article of claim 26, wherein the third dielectric layer comprises tin oxide.

29. The coated article of claim 28, wherein the coated article has a visible transmission of at least 76.5%.

30. The coated article of claim 26, further comprising another dielectric layer comprising tin oxide provided between the fourth dielectric layer comprising silicon oxide and the fourth contact layer.

31. The coated article of claim 30, further comprising another dielectric layer comprising silicon zirconium nitride provided between the fourth dielectric layer comprising silicon oxide and the second IR reflecting layer.

32. A coated article including a coating supported by a glass substrate, the coating comprising, from the glass substrate outwardly:

a first dielectric layer comprising silicon zirconium nitride;
a contact layer comprising at least one of NiCr, NiCrO_x and NiCrN_x;
a first IR reflecting layer comprising Ag;
a second dielectric layer comprising silicon zirconium nitride;
a third dielectric layer having an index of refraction n less than an index of refraction of at least one of the first and second dielectric layers;
a contact layer comprising at least one of NiCr, NiCrO_x and NiCrN_x;
a second IR reflecting layer comprising Ag;
a fourth dielectric layer comprising at least one of tin oxide and silicon nitride; and

wherein the coated article has a visible transmission of at least 70% and a sheet resistance (R_s) of no greater than 10 ohms/square.

33. The coated article of claim 32, wherein the third dielectric layer comprises one of silicon nitride and tin oxide.

34. The coated article of claim 32, wherein the coated article has a visible transmission of at least 75%.

35. A coated article including a coating supported by a glass substrate, the coating comprising, from the glass substrate outwardly:

a first dielectric layer comprising niobium oxide;
a contact layer comprising at least one of NiCr, NiCrO_x and NiCrN_x;
a first IR reflecting layer comprising Ag;
a second dielectric layer comprising niobium oxide;
a third dielectric layer having an index of refraction n less than an index of refraction of at least one of the first and second dielectric layers;
a contact layer comprising at least one of NiCr, NiCrO_x and NiCrN_x;

a second IR reflecting layer comprising Ag;
a fourth dielectric layer comprising silicon oxide; and
wherein the coated article has a visible transmission of at least 70%
and a sheet resistance (R_s) of no greater than 10 ohms/square.

36. The coated article of claim 35, wherein the coated article has a visible transmission of at least 75%, and neutral transmissive and/or glass side reflective color.

37. The coated article of claim 35, wherein the third dielectric layer comprises tin oxide.

38. The coated article of claim 35, wherein the coated article has a visible transmission of at least 76.5%.

39. The coated article of claim 35, further comprising another dielectric layer comprising tin oxide provided between the fourth dielectric layer comprising silicon oxide and the second IR reflecting layer.

40. The coated article of claim 39, further comprising another dielectric layer comprising niobium oxide provided between the another dielectric layer comprising tin oxide and the second IR reflecting layer.

41. The coated article of claim 35, further comprising a contact layer comprising at least one of NiCr, NiCrO_x and NiCrN_x provided directly above and in contact with at least one of the IR reflecting layers.

42. The coated articles of claim 35, wherein each of the dielectric layers comprising niobium oxide includes Nb₂O₅.

43. A coated article including a coating supported by a glass substrate, the coating comprising, from the glass substrate outwardly:

- a first dielectric layer comprising niobium oxide;
- a first IR reflecting layer comprising at least one of Ag and Au;
- a second dielectric layer comprising niobium oxide;
- a third dielectric layer having an index of refraction n less than an index of refraction of at least one of the first and second dielectric layers;
- a second IR reflecting layer comprising Ag;
- a fourth dielectric layer comprising at least one of tin oxide and silicon nitride; and

wherein the coated article has a visible transmission of at least 70% and a sheet resistance (R_s) of no greater than 10 ohms/square.

44. The coated article of claim 43, further comprising a contact layer including at least one of NiCr, NiCrO_x and NiCrN_x provided directly in contact with at least one of said IR reflecting layers.

45. A coated article including a coating supported by a glass substrate, the coating comprising, from the glass substrate outwardly:

- a first dielectric layer comprising niobium oxide;
- a first IR reflecting layer comprising at least one of Ag and Au;
- a second dielectric layer comprising niobium oxide;
- a second IR reflecting layer comprising Ag;
- a third dielectric layer comprising niobium oxide;
- a fourth dielectric layer comprising at least one of silicon oxide, silicon oxynitride, tin oxide and silicon nitride; and

wherein the coated article has a visible transmission of at least 70% and a sheet resistance (R_s) of no greater than 10 ohms/square.

46. The coated article of claim 45, further comprising a contact layer including at least one of NiCr, NiCrO_x and NiCrN_x provided directly in contact with at least one of said IR reflecting layers.

47. The coated article of claim 45, further comprising another dielectric layer comprising tin oxide located between the second IR reflecting layer and the second dielectric layer.

48. The coated article of claim 45, wherein the fourth dielectric layer comprises SiO₂.

49. The coated article of claim 45, wherein the fourth dielectric layer comprises silicon oxynitride.

50. The coated article of claim 49, wherein the fourth dielectric layer comprising silicon oxynitride is at least one of oxidation graded and nitrogen graded, so that an index of refraction n of the fourth dielectric layer comprising silicon oxynitride changes from a first value in a first portion of the fourth dielectric layer to a smaller second value in a second portion of the fourth dielectric layer, wherein the second portion of the fourth dielectric layer comprising silicon oxynitride with the smaller index of refraction n is further from the IR reflecting layers than is the first portion of the fourth dielectric layer.

51. The coated article of claim 45, wherein the fourth dielectric layer comprises silicon nitride.

52. A coated article including a coating supported by a glass substrate, the coating comprising:

first and second infrared (IR) reflecting layers each comprising at least one of Ag and Au;

a first dielectric portion having an effective index of refraction $n_1 \leq 3.0$ provided between the first IR reflecting layer and the glass substrate;

a second dielectric portion having an effective index of refraction n_2 less than or equal to n_1 , the second dielectric portion provided between the first and second IR reflecting layers;

a third dielectric portion provided over the first and second IR reflecting layers, said third dielectric layer having an effective index of refraction n_3 less than n_1 and n_2 , so that $n_3 < n_2 \leq n_1$; and

wherein the coated article has a visible transmission of at least 70%.

53. The coated article of claim 52, wherein the coated article has a visible transmission of at least 75%.

54. The coated article of claim 52, wherein the coated article has a visible transmission of at least 76.5%.

55. The coated article of claim 52, wherein the first and second dielectric portions each comprises a layer comprising titanium oxide.

56. The coated article of claim 52, wherein the third dielectric portion comprises a layer comprising silicon zirconium nitride and a layer comprising silicon oxide.

57. The coated article of claim 52, wherein the third dielectric portion comprises a layer comprising niobium oxide and a layer comprising silicon oxide.

58. The coated article of claim 52, wherein the second dielectric portion comprises a layer comprising tin oxide and a layer comprising one of niobium oxide and silicon zirconium nitride.

59. The coated article of claim 52, wherein the coated article has a visible transmission of at least 75% and a sheet resistance of no greater than 5 ohms/square.

60. The coated article of claim 52, wherein the coated article is an IG window unit.

ABSTRACT OF THE DISCLOSURE

Coated articles are provided with an anti-reflection system(s) which enables high visible transmission and/or low visible reflection. Neutral color is also achievable in certain example embodiments. In certain example embodiments, the anti-reflection system(s) is used in conjunction with a double silver (Ag) layer stack which provides low sheet resistance and/or emissivity.

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